



State of Utah

GOVERNOR'S OFFICE OF PLANNING AND BUDGET

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January 3, 1996

Dear Legislator:

Enclosed, you will find the annual report for the Utah Centers of Excellence Program (UCOEP). As you know, the State Advisory Council for Science and Technology has responsibility for review and oversight of the Centers Program and, in addition to reviewing this report, actively interact with many of the Centers throughout the year. The Council believes this program to be one of the best uses of state funds for encouraging business development from science and technology developments within our research universities. Our world has been transformed by science and technology in this century and this transformation is continuing, even accelerating, as the century comes to a close. In order for Utah businesses to become and remain competitive in a global marketplace, we will need to continue this partnership and cooperation between university researchers and business development specialists. The Council strongly recommends continued financial support for this program.

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The Council will be showcasing some of the outstanding developments of the Centers Program in the Capitol rotunda from February 25-29, 1996. We invite you to come see for yourself the results of this profitable state investment.

The number of spin-off companies, the matching dollars brought to our state, and the jobs created both within the Centers and in the industrial sector are testament to the strength of this vital economic development program. To take advantage of emerging technology markets and to maximize taxpayer investment, the Council strongly recommends you continue funding this program at the current annual level of \$2.5 million.

Respectfully submitted,

Suzanne Winters, Ph.D.
State Science Advisor

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Executive Director

Department of Community
and
Economic Development



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Division of Business and
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**CENTERS • OF
EXCELLENCE**

**❖ REPORT TO THE UTAH
STATE LEGISLATURE**

January 1996

UTAH CENTERS OF EXCELLENCE PROGRAM

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DEPARTMENT OF COMMUNITY AND ECONOMIC DEVELOPMENT
DIVISION OF BUSINESS AND ECONOMIC DEVELOPMENT

Joseph A. Jenkins, Executive Director
Richard J. Mayfield, Division Director

January 1996

To recipients of the Centers of Excellence Program Annual Report:

Attached is the fiscal 1994-95 annual Legislative Report for the Centers of Excellence Program. The report summarizes the achievements of the program during the fiscal year from July 1, 1994 through June 30, 1995 and in addition summarizes the funding allocations for the current 1995-96 fiscal year and highlights of the program through year end 1995.

Several noteworthy changes in the centers program have occurred since the last annual report. These changes have focused primarily on strengthening the programs commitment to the commercialization of centers technologies with subsequent positive economic impact.

Planning Grants

Significant new emphasis has been placed on planning grants to enhance the new centers selection process. Planning grants in the amount of \$10,000 are given to promising new centers prior to the formal submission of centers proposals. These funds are used to establish credible commercialization strategies for the proposed new centers and to conduct formal and independent market research to confirm market projections and opportunities. This information is invaluable in determining which new centers proposals should be funded and will greatly enhance the ultimate commercial success of these centers. Three planning grants were issued in fiscal 1994-95 and a subsequent seven have been issued so far in fiscal 1995-96.

Center Selection Process

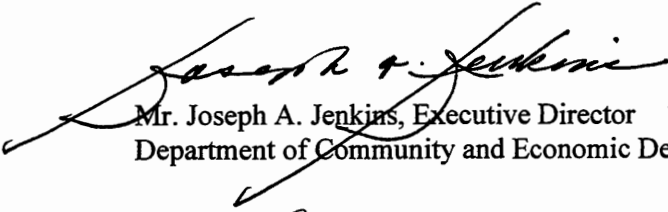
Funding decisions for each new center are made after significant review of formal proposals including site visits by members of the centers Advisory Council, review of market and strategic information provided from planning grant information or other market studies, independent scientific peer reviews conducted by the National Institute of Standards and Technology (NIST), thorough discussion and recommendations of the Advisory Council, and final review and approval by the DBED Board of Directors. Currently funded centers receive similar reviews with the addition of an examination of performance and achievements during previous funding periods. The primary focus of this analysis is to assure that funded centers have a maximum opportunity for success in the commercial marketplace.

Commercialization Consulting Program

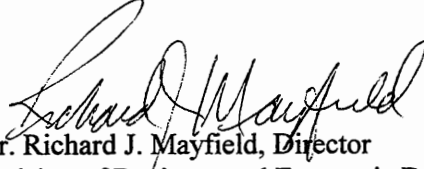
The consulting program was initiated in fiscal 1994-95 and has been formally funded in fiscal 1995-96. This program provides each funded center with the services of professional outside consultants selected on the basis of proven track records in commercialization. The consultants provide assistance in product definition, market analysis, development of business strategies, establishment of measured milestones, and other activities which supplement the technical skills of the center directors. The consulting program has already identified significant new market opportunities not previously seen and is moving several of the centers toward early commercialization. While some of these activities will take time to mature, the impact of this program on future centers successes will be significant. During fiscal 1995-96, \$97,500 has been allocated for this activity.

During the fiscal year reported, the centers program issued over \$1.9 million in grants to 16 active centers and 2 distinguished centers for their use in bringing significant new technologies closer to the marketplace. Matching funds in excess of \$24 million were also received by these centers. The matching ratio of 12.6 to 1 is believed to be the highest in the nation for programs of this kind and represents a critically important leverage for success in the program. A summary chart of some of the key measurements parameters and highlights of the centers program can be found on page 4 of this report:


The Centers of Excellence program continues to be one of the nation's most successful technology commercialization programs as measured by matching dollars, significant new commercialized products, and state economic impact. We believe that with a continued and strengthened emphasis on the importance of commercialization and with the establishment of the new initiatives described, the Centers of Excellence program will have an ever expanding and important role to play in Utah's economic future.



Mr. Joseph A. Jenkins, Executive Director
Department of Community and Economic Development



Mr. Richard J. Mayfield, Director
Division of Business and Economic Development



Mr. Roderick J. Linton, Director
Office of Technology Development

Utah Centers of Excellence Program

Report to the Legislature
FY1994-95

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Utah Centers of Excellence Program

Fiscal Year 1994-95

BACKGROUND INFORMATION

The Utah State Legislature created the Centers of Excellence Program (COEP) in 1986 (Refer to Legislation, page 44). Recognizing that "the growth of new industry and expansion of existing industry requires a strong technology base, new ideas, concepts, innovations, and prototypes," the Legislature recommended the allocation of economic development funds to the Centers of Excellence, to be awarded to college and university faculty on a competitive basis. The primary purpose of the Centers of Excellence is to enhance and expand the technical research, at institutions of higher education in Utah, to develop technologies "that are considered to have potential for economic development in this state." The economic impact of these technology transfers to the commercial sector, can be measured in new companies created, companies assisted, jobs created, and license agreements signed. In addition, the proprietary value of technologies created is reflected by patents pending and issued. On-going funding of the program is based on the real and potential economic impact which the Centers of Excellence Program had upon the State of Utah.

Proposals from researchers, for new and for renewal of existing Centers of Excellence, are reviewed by the National Institute of Standards and Technology (for scientific peer review) and by the Centers of Excellence Advisory Council consisting of executives from Utah businesses. Upon approval, new centers are funded, on a competitive basis, with a requirement for minimum 2:1 matching funds from the private and federal sectors. Matching funds are reported and audited on a regular basis. Centers are also audited regularly for the achievement of technical and commercial milestones. Centers directors are required to submit semi-annual reports to the centers program director. The Centers of Excellence Program Annual Report, here attached, is based on submitted reports and upon information gathered in site visits, audits and other data sources.

Centers are normally expected to be self-sustaining through license contract royalties and new research grants at the end of five years and are then graduated. Centers with especially noteworthy histories and on-going technological impact are designated as Distinguished Centers and thereafter may be funded on a project by project basis as requests are approved. Two distinguished centers, the Center for Advanced Combustion Engineering and Research (ACERC) and the Center for Supercritical Fluid Separations (CSFS) were funded in the 1994-95 period.

Since its inception, and through FY 1994-95, the program has created fifty-one Centers of Excellence, seven of which have been designated as Distinguished Centers, twenty-six have graduated, and eighteen are active during this reporting period.

This report summarizes centers status and achievements during the 1994-1995 fiscal year period (July 1, 1994 - June 30, 1995).

CENTERS OF EXCELLENCE - 1994/1995 FINANCIAL SUMMARY

	State Funding 1994/1995	Cumulative State Funding	Fed. Match 1994/1995	Indust. Match 1994/1995	Total Match 1994/1995	Cumulative Total Match
CENTERS FUNDED IN FISCAL 1994/1995:						
Advanced Composite Manufacturing - BYU	\$150,000	\$615,000	\$380,000	\$970,580	\$1,350,580	\$5,200,630
Aerospace Science Technology - Weber State	\$91,000	\$437,600	\$240,000	\$0	\$240,000	\$3,498,344
Cancer Genetic Epidemiology - U/U	\$20,000	\$354,323	\$2,563,632	\$320,916	\$2,884,548	\$12,968,195
Chemical Technology - Weber State	\$115,500	\$499,500	\$463	\$604,157	\$604,620	\$2,160,694
3-D Computer Graphics - Dixie College	\$50,000	\$200,000	\$0	\$125,000	\$125,000	\$379,432
Computer Graphics & Scientific Visualization - U/U	\$100,000	\$400,000	\$1,026,000	\$160,000	\$1,186,000	\$6,159,256
Dairy Foods Technology - USU	\$59,227	\$637,388	\$0	\$295,000	\$295,000	\$2,300,000
Developmental Molecular Biology - USU	\$107,480	\$210,880	\$244,162	\$0	\$244,162	\$488,321
Environmental Technologies - U/U	\$100,000	\$230,000	\$741,779	\$35,000	\$776,779	\$896,590
Genetic Improvement of Livestock - USU	\$98,500	\$198,000	\$219,485	\$0	\$219,485	\$566,985
Meat Processing Technology - USU	\$203,220	\$572,860	\$0	\$783,821	\$783,821	\$1,266,661
Multi-Media Education Technology - U/U	\$125,000	\$225,000	\$179,500	\$663,070	\$842,570	\$1,080,405
Multi-Media Education Technology - UVSU	\$100,000	\$225,000	\$125,000	\$1,850,000	\$1,975,000	\$2,634,050
Rapid Product Realization - BYU	\$200,000	\$200,000	\$15,000	\$467,914	\$482,914	\$967,150
Self-Organizing Intelligent Systems - USU	\$150,000	\$350,000	\$261,874	\$167,030	\$428,904	\$889,904
Value-Added Seed Technology - USU	\$70,000	\$280,000	\$135,688	\$39,782	\$175,470	\$613,454

DISTINGUISHED CENTERS FUNDED IN FISCAL 1994/1995:

Advanced Combustion Engineering Research - BYU	\$100,000	\$900,000	\$6,217,000	\$5,460,882	\$11,677,882	\$63,052,699
Supercritical Fluids - BYU	\$100,000	\$576,440	\$122,064	\$104,469	\$226,533	\$3,668,059
SUBTOTALS:	\$1,939,927	\$7,111,991	\$12,471,647	\$12,047,621	\$24,519,268	\$108,790,829

CENTERS NOT FUNDED IN FISCAL 1994/1995:

All Graduated Centers	\$0	\$10,556,430				\$86,404,274
All Distinguished Centers	\$0	\$4,214,000				\$63,441,883

TOTALS:	\$1,939,927	\$21,882,421	\$12,471,647	\$12,047,621	\$24,519,268	\$258,636,986
1994/1995 MATCHING RATIO	12.6					
CUMULATIVE MATCHING RATIO	11.8					

CENTERS OF EXCELLENCE - 1994/1995 ECONOMIC IMPACT SUMMARY

	Center Jobs	Average Salary	Industry Jobs	Average Salary	Spin-Off Companies		Assisted Companies	Patents		Licenses
					New	Cum.		Pend.	Issued	
CENTERS FUNDED IN FISCAL 1994/1995:										
Advanced Composite Manufacturing - BYU	32	\$24,750	7	\$34,000	4	46	26	5	3	2
Aerospace Science Technology - Weber State	7	\$20,571	18	\$38,889	0	2	4	0	0	0
Cancer Genetic Epidemiology - U/U	33	\$29,451	75	\$36,340	0	1	12	3	1	3
Chemical Technology - Weber State	11	\$15,362	22	\$30,000	0	2	17	4	4	3
3-D Computer Graphics - Dixie College	8	\$23,525	7	\$28,000	2	4	4	0	0	5
Computer Graphics & Scientific Visualization - U/U	17	\$39,529	8	\$56,250	0	1	10	0	0	1
Dairy Foods Technology - USU	7	\$30,000	4	\$28,000	0	2	3	0	1	1
Developmental Molecular Biology - USU	13	\$32,462			0	0	1	1	0	0
Environmental Technologies - U/U	16	\$46,438	6	\$78,833	0	0	12	1	0	4
Genetic Improvement of Livestock - USU	6	\$22,818			0	0	15	1	0	0
Meat Processing Technology - USU	11	\$18,818	25	\$19,471	0	3	3	2	3	1
Multi-Media Education Technology - U/U	21	\$44,000			0	0	19	0	2	0
Multi-Media Education Technology - UVSU	2	\$29,000	9	\$24,978	1	4	6	0	0	0
Rapid Product Realization - BYU	53	\$32,000	33	\$33,788	7	7	20	0	0	9
Self-Organizing Intelligent Systems - USU	10	\$35,052	6	\$40,000	0	1	4	5	0	3
Value-Added Seed Technology - USU	13	\$35,052			0	0	0	1	0	0
DISTINGUISHED CENTERS FUNDED IN FISCAL 1994/1995:										
Advanced Combustion Engineering Research - BYU	153	\$26,051	12	\$65,000	1	4	156	0	2	55
Supercritical Fluid - BYU	15	\$23,600	24	\$41,792	0	2	2	0	10	3
CENTERS NOT FUNDED IN FISCAL 1994/1995:										
All Graduated Centers	378	\$30,340	289	\$32,090		25	63		33	25
All Distinguished Centers	134	\$27,523	454	\$35,638		14	17	5	21	24
TOTALS:										
	939	\$29,317	999	\$38,942	15	118	394	28	80	139

Note: No information on industry jobs, average salary etc. is available for Centers that have not as yet spun-off companies

CENTERS OF EXCELLENCE PROGRAM

HIGHLIGHTS 1994-1995

STATISTICAL SUMMARY

State Funds Granted, 1994 - 95	\$1,939,927
Matching Funds	\$24,519,268
1994 - 95 Matching Fund Ratio	1:12.6
 Cumulative State Funds	 \$21,882,421
Cumulative Matching Funds	\$258,636,986
Cumulative Matching Funds Ratio	1:11.8
 Total Centers Jobs Created	 939
Total Industry Jobs Created	999
Total Companies Assisted	394
 Patents Pending	 28
Patents Issued	80
Cumulative License Agreements	139

The following are selected highlights of activities that have occurred during the year in spin-off companies, at individual centers, and in the centers program administration:

CENTER FOR CANCER GENETIC EPIDEMIOLOGY

Myriad Genetics Inc., a spin-off company, has been in the limelight recently. Scientists lead by researchers at the company, the University of Utah and international collaborators identified the mutated forms of the gene (BRCA1), which are responsible for breast and ovarian cancer. The company has attracted over \$131 million R & D funding from major pharmaceutical companies including Bayer Corporation and Ciba Pharmaceuticals to identify genes and to develop diagnostic tools for other human diseases including asthma, osteoporosis and cardiovascular diseases. In October 1995, Myriad Genetics Inc., had a successful **initial public offering** and sold 2.6 million shares at \$18 a share. **Dr. Mark Skolnick**, one of the founders and Vice President of the company received the **Governor's Award for Science and Technology for 1995**.

CENTER FOR CONTROLLED CHEMICAL DELIVERY

TheraTech, Inc., a spin-off from the Center continues to make significant strides in the area of transdermal patch technology. Recently several **international marketing agreements** to sell company products in specific markets were signed including: SmithKline Beecham (Europe, Australia and New Zealand), Astra AB (Scandinavia) and Wyeth-Ayerst International Inc. (Mexico, Central & South America, Middle East and non-French speaking Africa). In October 1995, the company received **FDA approval** to sell the testosterone transdermal patch (Androderm) in the U.S. SmithKline Beecham has acquired the exclusive marketing and distribution rights for the U.S. and Canada.

CENTER FOR MEAT PROCESSING TECHNOLOGY

Focused on developing techniques for ultrahigh pasteurization of meat and meat products, the center was granted two patents in 1995. The Center has signed a **license agreement** for the E.E.C. with a Dutch meat processing , Bakker, Lekkerkerk, and is pursuing additional licensing opportunities worldwide. A new Utah company is being incorporated to market the technology.

CENTER FOR AEROSPACE TECHNOLOGY (CAST)

The Center for Aerospace Technology at Weber State University received its final centers funding in the 1994-95 fiscal year. During this year, commercialization consultants have been working closely with the centers director to establish a commercialization strategy. **The center now intends to license its small satellite manufacturing and design technologies to a new Utah company** which will be incorporated in early 1996. The company will design and manufacture small, low-earth orbit satellites for commercial customers and will also arrange for launch vehicles, schedules, ground link communications, and component testing as a part of a comprehensive satellite service. In-depth market analysis, including meetings with potential customers and with industrial alliance partners, suggests that there is significant commercial interest in the company and that a viable market opportunity exists.

COMMERCIALIZATION CONSULTING PROGRAM

During 1994, the Centers of Excellence program initiated a commercialization consulting program through the Utah Small Business Development Center to assist centers in the creation of commercialization milestones. The program, which was expanded in the 1994-95 fiscal year, now includes the development of commercialization strategies, performance of market research, the establishment of industry partnerships and alliances, and other activities to promote commercialization. **The program has already resulted in the identification of several significant new market opportunities for centers technologies and the development of at least one strategic plan for the creation of a major new Utah business.** During the 1995-1996 fiscal year, \$97,500 has been set aside to fund this initiative. While the consulting program is still in the formative stages, it is anticipated that significant new successes for the centers program will result from this activity.

PLANNING GRANT PROGRAM

To enhance the quality of centers proposals and to facilitate early market analysis of commercial opportunities, potential new center applicants are being encouraged to apply for planning grants. Approximately \$90,000 of the fiscal 1995- 1996 budget was set aside for planning grants awarded on a competitive basis at \$10,000 per award.

Utah Centers of Excellence Program

New Spin-off Companies FY 1994-95		
Company Name and Address		Center
Legends Technologies	7766 Biscayne Drive, Salt Lake City, Utah 84121 (801) 942-8076	Center for Advanced Composites Manufacturing and Engineering BYU
Bradley Instruments	P O Box 1160, Salt Lake City, Utah (801) 571-7151	
Potter Management	855 East 700 North, Provo, UT 84606 (801) 374-8301	
Sound Composites	1280 N. Forbes Parkway Suite C, Salt Lake City, Utah 84116 (801) 595-0400	
Green Hill Recycling	410 South 2300 West, Salt Lake City, Utah 84104 (801) 973-2510	Center for Advanced Construction Materials, U/U
Utah Valley On-Line	739 South 600 West, Orem, UT 84058 (801) 225-5185	Center for Multimedia Education and Technology - UVSC
Accuserve, Inc.	506 S. Main, Bountiful, UT (801) 298-9161	Center for Rapid Product Realization BYU
American International	60 East 100 S., Room 20, Provo UT 84606, (801) 377-0570	
Bolick Co.	264 West State, Pleasant Grove, UT (801) 785-6722	
Tile Roof Associates	P O Box 682, American Fork, UT 84003 (801) 756-8666	
Hatch Biomedical	1219 North 400 East, Logan, UT 84341 (801) 753-8110	
Youth Reclamation, Inc.	3549 N. University Ave., Provo, UT 84604 (801) 373-2151	
CellTek, International	Geneva Road, Orem, UT 84604 (801) 225-1867	
Info West	1845 W. Sunset, St. George, UT, 674-5638	Center for 3-D Computer Graphics, Dixie College
NetEx	970 N. 1300 W., St. George, UT 84770, 634-1730	

ACTIVE CENTERS

Active Centers are those centers receiving funding during the 94-95 fiscal year.

ACTIVE CENTERS

Advanced Composite Manufacturing	8
Aerospace Science Technology	9
Cancer Genetic Epidemiology	10
Chemical Technology	11
3-D Computer Graphics	12
Computer Graphics & Scientific Visualization	13
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Developmental & Molecular Biology	15
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Meat Processing Technology	18
Multimedia Education Technology - U/U	19
Multimedia Education Technology - UVSC	20
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Self-Organizing Intelligent Systems	22
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Center for Advanced Composites Mfg. & Engineering

Director, Brent Strong, Ph.D., Brigham Young University, Provo, Utah

(Phone 378-7878, Fax 378-7575, e-mail:strongb@byu.edu)

Background

Established in 1990 as the focal point and coordinator of technical knowledge and resources in Utah in the areas of composite materials, plastics, and other advanced materials. ACME assists existing industry and start-up companies and also conceives, invents, develops, and spins off new and enhanced products into commercial enterprises.

FY94-95 Overview

Current

1994-95 Award	\$150,000
Matching Funds	\$1,350,580
Patents Pending	5
Patents Issued	3
License Agreements	2
Spin-off Companies	4
Companies Assisted	26
Industry Jobs Created	7
Center Jobs Created	32

Cumulative Accomplishments

Cumulative

Awards	\$615,000
Matching Funds	\$5,200,630
Patents Issued	3
License Agreements	2
Spin-off Companies	46

Technologies

- Damping of composites through unique orientation of fibers.
- Improvement of fiber binding on thermoplastic composites.
- A forming technique for large thermoplastic composites.
- Cure and contamination sensing devices which allow low-cost detection of physical or chemical changes in many non-conducting fluids such as resins, oils, transformer fluids, etc.
- Resource for all companies on advanced materials and manufacture of these materials.

Center Highlights

- ACME has assisted Merit Medical with five products during the past year. Each of these products has faced a major manufacturing or design problem that required assistance beyond Merit's capability and, because of the excellent relationship between Merit Medical and ACME, the center was asked to supervise the solving of these problems. Each problem was successfully resolved and Merit was able to resume or initiate production on the product. Merit estimates that the value of ACME's contribution for these products has been in excess of \$500,000 this year.
- The Center has devised standardized tests for the quality and strength of roll-out garbage cans used by municipalities across the country, including Salt Lake County, Ogden, and Provo. Such tests determine the strength and durability of such plastic containers, enabling manufacturers to produce stronger garbage cans. Local governments say the garbage cans last longer, resulting in a savings of public funds. Provo, for instance, has spent \$1 million on the roll-out garbage cans for use by its residents and needs such an investment to last for an extended period. Roll-out garbage containers picked up by automated garbage trucks are used by up to 20% of U.S. homes and comprise a \$120 million annual industry.

Center for Aerospace Technology

Director, Kermit Reister, Ph.D., Weber State Technology, Ogden, Utah
(Phone 626-7272, Fax 626-7951, e-mail: kreister@cc.weber.edu)

Background

Established in 1988 with a focus on the development of small, low-earth orbiting satellites and related aerospace technology.

<u>FY94-95 Overview</u>		<u>Cumulative Overview</u>	
Current		Cumulative	
1994-95 Award	\$91,000	Awards	\$437,600
Matching Funds	\$240,000	Matching Funds	\$3,498,344
Patents Pending	0	Patents Issued	0
Patents Issued	0	License Agreements	0
License Agreements	0	Spin-off Companies	2
Spin-off Companies	0		
Companies Assisted	4		
Industry Jobs Created	18		
Center Jobs Created	7		

Technologies

- The Center exploits opportunities with expertise developed in the design, manufacture, and operation of small satellites to **commercialize technologies**.
- The Center has developed and flown two satellites, NUSAT I and WEBERSAT, receiving **world-wide recognition** as a leader in the field of small and inexpensive satellite development.

Center Highlights

- The Center has worked on a satellite communications system with Wasatch Aerospace that will initially be used by public electric utility companies.
- The Center is currently focusing on **commercializing satellite technology** developed over the past ten years. The center now intends to license its small satellite manufacturing and design technologies to a new Utah company which will be incorporated in early 1996. The company will design and manufacture small, low-earth orbit satellites for commercial customers and will also arrange for launch vehicles, schedules, ground link communications, and component testing as a part of a comprehensive satellite service. In-depth market analysis, including meetings with potential customers and with industrial alliance partners, suggests that there is significant commercial interest in the company and that a viable market opportunity exists.
- **Two aerospace companies** now exist in Utah through the Center's efforts.
- The Center is developing aerospace products that will **increase business and employment** in Utah.

Center for Cancer Genetic Epidemiology

Director, Mark Skolnick, University of Utah, Salt Lake City, Utah
(Phone 581-5070, Fax 581-6052, e-mail:mark@morgan.med.utah.edu)

Background

Established in 1991 to study the genetic causes and origins of common cancers (eg. breast, melanoma, colon, and prostate) and to develop DNA based diagnostics. Focus is on developing approaches to gene mapping and gene isolation for future applications in cancer diagnosis and therapy.

FY94-95 Overview

Current

1994-95 Award	\$20,000
Matching Funds	\$2,884,548
Patents Pending	1
Patents Issued	0
License Agreements	2
Spin-off Companies	1
Companies Assisted	12
Industry Jobs Created	75
Center Jobs Created	33

Cumulative Overview

Cumulative

Awards	\$354,323
Matching Funds	\$12,968,195
Patents Issued	1
License Agreements	3
Spin-off Companies	1

Technologies

- Genetic analysis and gene localization, discovery, diagnostics, and therapies to ultimately identify and isolate genes responsible for common cancers.

Center Highlights

- Commercial partner and spin-off company, Myriad Genetics, Inc., has **attracted international attention and investments** from prominent pharmaceutical companies, including a **combined \$131 million** over the next five years from Bayer Corporation and Ciba Pharmaceuticals.
- Myriad employs more than 60 people and it's economic impact on the state of Utah is estimated at \$7 million a year.
- Myriad became a public company in October 1995 with a valuation of \$54 million.
- The Center has cloned the 17q linked breast cancer gene and the 9p linked melanoma gene.
- Current efforts are directed toward isolation of a second breast cancer susceptibility gene, gathering more cancer families, and conducting linkage studies of breast, colon, and prostate cancers.
- Center director Mark Skolnick **received the 1995 Governor's Award for Science and Technology.**

Center for Chemical Technology

Director, Edward Walker, Ph.D., Weber State University, Ogden, Utah
(Phone 626-6162, Fax 626-7445, e-mail: ewalker@scinet.weber.edu)

Background

Established in 1990 and functions as an innovative resource to the business community by conducting applied research in a variety of chemistry-related areas leading directly to new/enhanced products. The center facilitates the collaboration of Utah companies with diversified chemical interests to form alliances that benefit them and the state.

FY94-95 Overview

Current

1994-95 Award	\$115,500
Matching Funds	\$604,620
Patents Pending	4
Patents Issued	1
License Agreements	0
Spin-off Companies	0
Companies Assisted	17
Industry Jobs	22
Center Jobs Created	11

Cumulative Overview

Cumulative

Awards	\$499,500
Matching Funds	\$2,160,694
Patents Issued	4
License Agreements	3
Spin-off Companies	2

Technologies

- Natural Product chemistries
- Patented oil-sand separation and remediation
- Bioremediation of toxic wastes using bacteria-derived enzyme systems

Center Highlights

- **Eastman Chemical**, in its first corporate entry into Utah, plans construction of a pilot facility for extracting the nutritional supplement beta carotene contained in algae harvested from the Great Salt Lake. Facility will **employ 20 to 30 people**.
- Construction is planned for a new tar-sand **production facility in Vernal** that is expected to produce 1,000 barrels per day of high-grade bitumen by summer of 1996.
- Corporate partner, Nutraceutical, Inc., has acquired two other companies and moved its manufacturing and marketing to Utah, where **employment has been doubled and production has been tripled**.
- Nutraceutical products developed and tested with the Center gross more **\$20 million in annual sales**.
- The Center has **helped launch** a new protein technology company, **Biofractionations**.
- The Center has been **granted four patents**.
- The Center has **license agreements** with three companies.
- Major **contracts** have been signed with **TRW** and **AORC** to study environmental fate of azide impacted landfill soils.

Center for 3-D Computer Graphics

Director Eric Pedersen, Dixie College, St. George, Utah
(Phone 652-7804, Fax 628-1286, e-mail: pedersen@cc.dixie.edu)

Background

Established in 1991 to study practical applications of computer graphics, specifically networking and 3-D graphics. The main focus is to conduct market research on computer graphics and networking tools and then cooperate with private industry to evaluate and create products and support services that will meet market demands.

<u>FY94-95 Overview</u>		<u>Cumulative Overview</u>	
Current		Cumulative	
1994-95 Award	\$50,000	Awards	\$200,000
Matching Funds	\$125,000	Matching Funds	\$379,432
Patents Pending	0	Patents Issued	0
Patents Issued	0	License Agreements	5
License Agreements	0	Spin-off Companies	4
Spin-off Companies	2		
Companies Assisted	4		
Industry Jobs Created	7		
Center Jobs Created	8		

Technologies

- Producing computer graphics products and technical support services.
- Writing software code and licensing the source code to a company.
- Creating computer graphics products and licensing the product to a company.
- Developing seminars and product research and support in partnership with industry.

Center Highlights

- The Center has created and/or assisted the following **spin-off companies**: InfoWest; NetEx, Interon, and Illustrative Impression.
- The Center has a license agreement with Mira Imaging for \$140,000 for the Center's source code in HyperSPACE Windows. Sales of products using the source code are projected at \$1 million a year for Mira.
- The first product developed by the Center during its first year is still generating about \$120 a month and represents a 15% royalty from Strata, Inc.
- The Spirit of Utah Game developed by the Center is being sold through the Heritage Foundation and *St. George Magazine*.

Center for Computer Graphics and Scientific Visualization

Directors Riesenfeld and Cohen, Ph.D's, University of Utah, Salt Lake City, Utah
(Phone 581-8235, Fax 581-5843, e-mail: cohen@cs.utah.edu)

Background

Established in 1991 to develop integrated computer aided solutions to problems in computer graphics, scientific visualization, computer aided geometric design and computer aided manufacturing for industrial applications.

<u>FY94-95 Overview</u>		<u>Cumulative Overview</u>	
Current		Cumulative	
1994-95 Award	\$100,000	Awards	\$400,000
Matching Funds	\$1,186,000	Matching Funds	\$6,159,256
Patents Pending	0	Patents Issued	0
Patents Issued	0	License Agreements	1
License Agreements	0	Spin-off Companies	1
Spin-off Companies	0		
Companies Assisted	10		
Industry Jobs Created	8		
Center Jobs Created	17		

Technologies

- Computer design, modeling, graphics, and manufacturing technology for automating the whole "art-to-part" process, scalable from a small job shop to a large advanced industrial shop.
- National televideo infrastructure and learning via the national information highway.

Center Highlights

- The Center's spin-off company, Engineering Geometry Systems (EGS) is creating products using Center technology.
- EGS has also entered into a strategic alliance for the sale of its software to Bridgeport Machines, Inc., a worldwide manufacturer of machine tools, to design and build machine tools to meet specific needs. This has resulted in an increase in employment at EGS.
- EGS has created and delivered a custom product to Hill Air Force Base to increase its manufacturing productivity. Center technology has served as a base for this customized product.
- EGS is using Center technology in working with Loral Defense Systems for the creation of parts, which the company could not get designed or manufactured elsewhere.
- The Center is working with consultants for the application of Center technology to the manufacture of a new oil drill bit. Success in this venture is expected to enhance a company's business by \$5-10 million a year.
- Briefed Governor Leavitt on various leading edge interactive televideo education methods.

Center for Dairy Foods Technology

Director, Paul A. Savello, Utah State University, Logan, Utah

(Phone 797-3618, Fax 797-2379, e-mail:psavello@cc.usu.edu)

Background

Established in 1990 to develop new technologies and products for the dairy foods industry.

FY94-95 Overview

Current

1994-95 Award	\$59,227
Matching Funds	295,000
Patents Pending	0
Patents Issued	0
License Agreements	1
Spin-off Companies	0
Companies Assisted	3
Industry Jobs Created	4
Center Jobs Created	7

Cumulative Overview

Cumulative

Awards	\$637,388
Matching Funds	\$2,300,000
Patents Issued	1
License Agreements	1
Spin-off Companies	2

Technologies

- The Center investigates methods to fractionate (separate) and concentrate milk components in non-degradative ways. Specialized membranes are used to separate proteins, carbohydrates, and milk salts.
- Aseptic processing of milk and dairy products results in shelf-stable, non-refrigerated foodstuffs that have minimal flavor change, retain nutrient makeup, and permit transportation, distribution, and storage without refrigeration.

Center Highlights

- The Center has signed an **option agreement** with Utah Milk Technologies, a business venture group to **pursue commercialization** of membrane-concentrated, sterile milk for export. Utah Milk Technologies has signed an agreement with Tetra-Alfa, the world's largest manufacturer of ultra-high temperature and aseptic packaging equipment.
- A **patent** for the Center's "**Creamier Skim Milk**" was issued in November 1994.
- **Gossner Foods, Inc.**, Logan, holds the contract for the production and packaging of new products researched and developed by national food companies with the **assistance of the Center**.
- **Heart-to-Heart Foods, Inc.**, Richmond, which produces yogurt and ice cream products and new lines of cream cheese, has used **Center equipment and expertise** to research and develop new product lines for distribution in Utah.
- **International Dairy Foods Association** has shown interest in "**Creamier Skim Milk**" to increase consumer acceptability of skim milk.

Center for Developmental and Molecular Biology

Director, Kenneth White, Utah State University, Logan, Utah

(Phone 797-2149, Fax 797-2118, e-mail: kwhite@cc.usu.edu)

Background

Established in 1993 to facilitate product development, increase the commercialization process of current near-term products, supplement near-term research, and stimulate additional patent development.

FY94-95 Overview

Current

1994-95 Award	\$107,480
Matching Funds	\$244,162
Patents Pending	1
Patents Issued	0
License Agreements	0
Spin-off Companies	0
Companies Assisted	1
Industry Jobs Created	0
Center Jobs Created	13

Cumulative Overview

Cumulative

Awards	\$210,880
Matching Funds	\$488,321
Patents Issued	0
License Agreements	0
Spin-off Companies	0

Technologies

- **Primary cell culture medium development.** Researchers at Hyclone Laboratories, Inc., working with scientists at USU have developed a Lymphocyte culture fluid that outperforms all other culture media in the culture of lymphocytes and embryos.
- **Lytic peptide expression and expression of vector design.** Researchers have evaluated developed, synthesized, and characterized several synthetic chemotherapeutic peptides referred to as lytic peptides. These peptides have been shown to be effective against a number of disease states that currently are either very difficult or impossible to treat with conventional therapy.

Center Highlights

- Hyclone Laboratories has licensed lymphocyte culture fluid and embryos to a **new Utah entity**.
- A **new commercial opportunity** has been identified for lytic peptide application which can be rapidly brought to market. Discussions are continuing with an **established company for commercialization**.
- The Center is negotiating **research agreements** with one company to use one component of its lytic peptide technology.

Center for Environmental Technologies

Director, Russ Price, University of Utah, Salt Lake City, Utah
(Phone 585-3277, Fax 585-5607, e-mail:russ.price@dean.eng.utah.edu)

Background

Established in 1993 to support Utah's environmental technologies industry through focused research and development in monitoring and sensing technologies, waste-stream reduction technologies, pollutant destruction and remediation, technology transfer, and advanced technical training.

FY94-95 Overview

Current

1994-95 Award	\$100,000
Matching Funds	\$776,779
Patents Pending	1
Patents Issued	0
License Agreements	2
Spin-off Companies	0
Companies Assisted	12
Industry Jobs Created	6
Center Jobs Created	16

Cumulative Overview

Cumulative

Awards	\$230,000
Matching Funds	\$896,590
Patents Issued	0
License Agreements	4
Spin-off Companies	0

Technologies

- Knowledge-based expert system for Waste-fired Cement Kilns.
- Environmental applications of Time-of-Flight Mass Spectrometry
- Environmental applications of the Air-Sparged Hydrocyclone (radionuclide separations, oil-water separations, VOC stripping).
- HydroPur industrial wastewater recycling system.

Center Highlights

- A major effort has been made to assist the defense industry in Utah to realize effective technology transfer and enhance environmental technologies.
- A subcontract was signed with Thiokol Corp. For development of an electrolytic process to recycle industrial wastestreams. A pilot plant is in place at Thiokol.
- Testing under a series of contracts with Utah sewer treatment systems has been performed, introducing new techniques in that industry.
- Materials and processing-testing contracts have been completed for two Utah-based entrepreneurs.
- The Center has formed strategic partnerships with twelve companies and federal installations.

Center for Genetic Improvement in Livestock

Director Noelle Cockett, Ph.D., Utah State University, Logan, Utah
(Phone 797-3903, Fax 797-3904, e-mail: fanoelle@cc.usu.edu)

Background

Established in 1991 to outline methods of genetically improving livestock using the rapidly evolving technologies of DNA genetic markers and embryo cloning.

<u>FY94-95 Overview</u>		<u>Cumulative Overview</u>	
Current		Cumulative	
1994-95 Award	\$98,500	Awards	\$198,000
Matching Funds	219,485	Matching Funds	\$566,985
Patents Pending	1	Patents Issued	0
Patents Issued	0	License Agreements	0
License Agreements	0	Spin-off Companies	0
Spin-off Companies	0		
Companies Assisted	15		
Industry Jobs Created	0		
Center Jobs Created	6		

Technologies

- Specific genetic markers, known as callipyge genes, associated with heavy muscling and reduced fat in sheep have been identified.
- The improvement of embryo cloning efficiency.
- The Center has developed a test that is 97% accurate in identifying the callipyge gene; no other laboratory in the world has the available information and, therefore cannot duplicate the test.

Center Highlights

- The Center has determined that the callipyge gene provides an **additional \$16.06 (10.3%)** to the value of each marketed sheep. If just 25% of the sheep in Utah carried the callipyge gene, the potential added value impact to Utah would be \$1.4 million.
- Development of a **commercially-available** genetic marker test for callipyge has been initiated, with its availability being **advertised** through publications, presentations, and other means, with efforts primarily directed toward sheep producers and meat packers.
- The differences in muscle mass in sheep **significantly affect retail yield** and the percentage of carcass weight found within the high-priced cuts.
- It has been determined that callipyge animals require less feed for each pound of gain (another **economic advantage** of the mutation).
- Animals carrying the callipyge gene are being distributed to Utah sheep producers.

Center for Meat Processing Technology

Director, Von T. Mendenhall, Ph.D., Utah State University, Logan, Utah
(Phone 797-3463, Fax 797-2379, e-mail: vonm@ext.usu.edu)

Background

Established in 1991 for the development of new meat products and processing technologies.

FY94-95 Overview

Current

1994-95 Award	\$203,220
Matching Funds	\$783,821
Patents Pending	1
Patents Issued	2
License Agreements	0
Spin-off Companies	0
Companies Assisted	3
Industry Jobs	25
Center Jobs Created	11

Cumulative Accomplishments

Cumulative

Awards	\$572,860
Matching Funds	\$1,266,661
Patents Issued	3
License Agreements	1
Spin-off Companies	0

Technologies

- Ultra-High Temperature (UHT) pasteurization of meat surfaces.
- Low-fat lamb chops, beef steaks, pork chops, and bacon.
- Processing technology to reduce fat content of raw meat.
- Processing technology to bond meat to bone.
- Combining UHT with electron beam radiation technology to produce sterile meat products.
- UHT pasteurization combined with High-Temperature Aging (HTA) to produce tender steaks and roasts from the cheaper, less tender primal cuts of beef carcasses.

Center Highlights

- A **license agreement** involving Bakker of Holland and Agri-Marketing of Woods Cross, Utah has been signed for the use of UHT processing and the marketing and sale of low-fat meat products in the European Economic Community countries.
- Agri-Marketing has an option to market UHT low-fat meat products in the US and Canada.
- A **license agreement** for South America and the Pacific Rim is expected to be signed with Boa Vista in Brazil.
- Estimated sales of UHT-processed meats sold by Bakker, Agri-Marketing, and Boa Vista is at least \$5 million.
- Center technology has led to the establishment of ConAgra, a federally-inspected production facility in Springville, Utah. It has seven to ten employees and is producing about 8,000 pounds of meat per day.
- **Two patents were issued** to the Center in fiscal year 1995 for UHT pasteurization of meat and meat products and the bonding of meat to bone.

Center for Multimedia Education and Technology

Director Magdy F. Iskander, Ph.D., University of Utah, Salt Lake City, Utah
(Phone 581-6944, Fax 581-5281, e-mail:iskander@ee.utah.edu)

Background

Established in 1993 for the development, production, and distribution of interactive multimedia software modules for science, math, and engineering education.

<u>FY94-95 Overview</u>	<u>Cumulative Overview</u>
Current	Cumulative
1994-95 Award \$125,000	Awards \$225,000
Matching Funds \$842,570	Matching Funds \$1,080,405
Patents Pending 1	Copyright Issued 2
Copyright Issued 1	License Agreements 0
License Agreements 0	Spin-off Companies 0
Spin-off Companies 0	
Companies Assisted 19	
Industry Jobs Created 0	
Center Jobs Created 21	

Technologies

- Development of multimedia software for education.
- Production and distribution of interactive multimedia educational modules on CD-ROM.

Center Highlights

- **Two CD-ROM products** have been developed and produced and are available for sale. They include the "Calculus Castle" CD-ROM and one for engineering electromagnetics.
- The Center is managing the Conceptual Learning of Science (COLOS), USA project, which is a consortium of eleven universities and is sponsored by Hewlett-Packard Company.
- With the proposed establishment of the spin-off company, CAEME Multimedia Software, Inc and the establishment of the COLOS USA project, the Center promises to establish additional jobs in the state.
- Nineteen companies have received assistance from the Center.
- Together with John Wiley & Sons, the Center published it's award-winning journal, Computer Applications in Engineering Education.
- The Center considers it's greatest impact in placing Utah at the forefront of technology-based education, resulting in a highly-qualified work force which will support existing companies and attract new businesses to the state.

Center for Multimedia Education and Technology

Director Gary Phelps, UVSC, Orem, Utah
(Phone 235-7594, Fax 222-8570, e-mail:phelpsga@uvsc.edu)

Background

Established in 1993 to develop state-of-the-art, interactive multimedia technology and also to author and produce with industrial partners a wide range of commercial training and education applications.

<u>FY94-95 Overview</u>		<u>Cumulative Overview</u>	
Current		Cumulative	
1994-95 Award	\$100,000	Awards	\$225,000
Matching Funds	\$1,975,000	Matching Funds	\$2,634,050
Patents Pending	0	Patents Issued	0
Patents Issued	0	License Agreements	0
License Agreements	0	Spin-off Companies	4
Spin-off Companies	1		
Companies Assisted	6		
Industry Jobs Created	9		
Center Jobs Created	2		

Technologies

- Interactive multimedia computer-based authoring systems. Some authoring technologies will be copyrighted, held, and owned by UVSC and the Center while others will be developed with external corporate partners.

Center Highlights

- During the year, CMET has joined with companies in the creation of multimedia titles.
- CMET technology has resulted in the formation of a new company, Utah Valley On-Line.

Center for Rapid Product Realization

Director, David Sorensen, Brigham Young University, Provo, Utah
(Phone 378-9000, Fax 378-7575, e-mail: dks@et.byu.edu)

Background

Established in 1994 to provide manufacturing technology extension services designed to assist small manufacturing companies, to bridge the gap between new product concepts and manufacturing realization, and to develop innovative technologies which will result in products, patents, and related economic benefits for the state.

FY94-95 Overview

Current

1994-95 Award	\$200,000
Matching Funds	\$482,914
Patents Pending	0
Patents Issued	0
License Agreements	6
Spin-off Companies	7
Companies Assisted	20
Industry Jobs Created	33
Center Jobs Created	53

Cumulative Overview

Cumulative

Awards	\$200,000
Matching Funds	\$967,150
Patents Issued	0
License Agreements	9
Spin-off Companies	7

Technologies

- Prominent technologies and capabilities include advanced computer-assisted design systems, conventional and rapid prototyping, advanced machining and fabrication technologies, state-of-the-art process definition and simulation.
- The Center is coordinating other institutions in the state as they apply to new product opportunities.

Center Highlights

The Center has:

- **Launched** seven new companies.
- Established nine **royalty agreements**.
- Completed work on ten new products.
- Initiated work on 30 additional products.
- Contacted 1500 manufacturers.
- Received 210 inquiries for new product assistance from companies and inventors.
- Received 117 formal applications for new product assistance.

Center for Self Organizing Intelligent Systems

Director, Robert W. Gunderson, Ph.D., Utah State University, Logan, Utah
(Phone 797-2924, Fax 797-3054, e-mail: snowvax@cc.usu.edu)

Background

Established in 1993 to assist Utah companies in developing marketable products which use the technology of intelligent systems.

FY94-95 Overview

Current

1994-95 Award	\$150,000
Matching Funds	\$428,904
Patents Pending	2
Copyright Received	3
License Agreements	0
Spin-off Companies	0
Companies Assisted	4
Industry Jobs Created	6
Center Jobs Created	10

Cumulative Overview

Cumulative

Awards	\$350,000
Matching Funds	\$889,904
Copyright Received	3
License Agreements	3
Spin-off Companies	1

Technologies

- Intelligent Systems Technology generally includes any device and/or software concept which attempts to artificially replicate unique cognizance and control abilities of the human mind.
- Artificial neural networks are designed to mimic the ability of the brain and central nervous system to learn and generalize from past experience.
- Fuzzy logic was introduced as a way of emulating the reasoning processes fundamental to human intelligence.
- Virtual presence controllers attempt to place a remote human operator or controller in a virtual environment identical to that encountered by the controlled process.

Center Highlights

- Center projects to date that have resulted in **products** include: two irrigation control systems, two applications to exercise machines, autonomous micro-robotic vehicle control products, a coin recognition product, intelligent wheelchair control augmentation systems for the severely handicapped and aged.
- The vehicle control project has developed into two **product spin-offs**: a vehicular sensing platform for hazardous waste-site applications and a "hands-on" Mars exploration educational kit.
- Campbell Scientific, Inc. projects **total sales** of irrigation controllers to be \$5 million a year over a seven-year period.
- ProForm Fitness Products, Inc. estimates **first-year sales** of exercise equipment with center developed fuzzy-belt controller and fuzzy "spotter" to be \$40 million.
- The Center has completed **technology transfer** of the intelligent coin recognition machine to a **start-up company**.
- Monetary Services, Inc., using a Center-developed neural network and computer-imaging technology, estimates a minimum of 30,000 installation sites for a device to be leased for \$1,000 a month.

Center for Value Added Seed Technology

Director Grant Vest, Ph.D., Utah State University, Logan, Utah
(Phone 797-0880, Fax 797-3376, e-mail:grant@agx.usu.edu)

Background

Established in 1991 to produce value-added crops using forefront plant biotechnologies and conventional plant breeding.

<u>FY94-95 Overview</u>		<u>Cumulative Overview</u>	
Current		Cumulative	
1994-95 Award	\$70,000	Awards	\$280,000
Matching Funds	\$175,470	Matching Funds	\$613,454
Patents Pending	1	Patents Issued	0
Patents Issued	0	License Agreements	0
License Agreements	0	Spin-off Companies	0
Spin-off Companies	0		
Companies Assisted	0		
Industry Jobs Created	0		
Center Jobs Created	13		

Technologies

- Conventional plant breeding of exotic wheatgrass forage and turf plants collected worldwide.
- Turf grasses for roadways, lawns, golf course, and parks, for which watering requirements are only 30% to 40% of currently-used turf grass varieties.
- Forage grasses with superior yield under arid-land conditions.
- Competitively-priced wheat and rice varieties that have the high yields of expensive hybrid varieties.
- Procedures to mass clone superior crop and forestry plants and to genetically engineer cereals, cotton, and other crops.

Center Highlights

- **Conventional plant breeding:** Selected lines of crested wheatgrass were combined and breeder seed has been produced. Studies through Utah are being conducted to determine optimum irrigation, cutting height, and fertility levels. An improved forage grass will be released this year.
- **Molecular genetic marker technology:** Produced through plant breeding an interspecific population of wild Australian wheatgrass.
- **Plant tissue culture:** These show promise for use in the mass cloning and genetic engineering of agronomic, horticultural, and forestry plants.
- Turf and forage grass cultivars released by CFAST will be protected by the Plant Variety Protection Act. Several companies have expressed interest.
- CFAST is collaborating with federal and private labs to develop bioreactors for the cloning of crops and forestry trees and to improve genetic engineering procedures.

DISTINGUISHED CENTERS

Distinguished Centers are those that have graduated and have received national recognition for their work or have received outside funding in excess of \$5 million. They have demonstrated ability in technology transfer or show unique opportunities for such. Centers with especially noteworthy histories and on-going technological impact are designated as Distinguished Centers and thereafter may be funded on a project by project basis as requests are approved.

DISTINGUISHED CENTERS

The following two distinguished centers received funding during the fiscal 1994-95 year.

Advanced Combustion Engineering Research	25
Supercritical Fluid Separations	26

Center for Advanced Combustion Engineering Research

Director, L. Doug Smoot, Brigham Young University, Provo, Utah
(Phone 378-8930, Fax 378-6033, e-mail:lds@byu.edu)

Background

Established in 1986 as a joint project between BYU and the University of Utah for the purpose of advancing combustion engineering research, education, and technology. The principle focus is on clean and efficient use of fossil fuels including coal, oil, and natural gas as well as the combustion of toxic and municipal solid wastes. Received "Distinguished Center" status in 1991.

FY94-95 Overview

Current

1994-95 Award	\$100,000
Matching Funds	\$11,677,882
Patents Pending	0
Patents Issued	2
License Agreements	0
Spin-off Companies	1
Companies Assisted	156
Industry Jobs Created	12
Center Jobs Created	153

Cumulative Accomplishments

Cumulative

Awards	\$900,000
Matching Funds	\$63,052,699
Patents Issued	2
License Agreements	55
Spin-off Companies	4

Technologies

The international competitiveness of the nation's basic and high-technology industries relies in part on the ability to move efficient-use fuel resources such as coal, heavy oil, oil shale, and tar sands, which are abundantly available in Utah and the western United States. Specific Center technologies include:

- Mechanisms of fossil-fuel combustion and pollutant and soot formation.
- The relationship between fuel properties and conversion.
- Computer models to control and record the performance of particular combustion chambers.
- Pollution formation/control and waste incineration.

Center Highlights

- The Center has attracted more than \$61 million in grants and other funds over ten years.
- The Center has provided new technology for Utah companies such as REI, Inc and Geneva Steel Company.
- New technology and software products from the Center have led to the creation of four new businesses in Utah.
- The Center is one of only 18 highly sought-after national engineering centers.

Center for Supercritical Fluid Separations

Director Milton Lee, Ph.D., Brigham Young University, Provo, Utah
(Phone 378-2135, Fax 378-5474, e-mail: milton_lee@byu.edu)

Background

Established in 1986 and received "Distinguished Center" status in 1991 as a focal point for research and development, education, and training in chemical analysis where high resolution separations and high sensitivity detection are emphasized.

FY94-95 Overview

Current

1994-95 Award	\$100,000
Matching Funds	\$226,533
Patents Pending	0
Patents Issued	1
License Agreements	3
Spin-off Companies	0
Companies Assisted	2
Industry Jobs Created	24
Center Jobs Created	15

Cumulative Overview

Cumulative

Awards	\$576,440
Matching Funds	\$3,668,059
Patents Issued	10
License Agreements	3
Spin-off Companies	2

Technologies

- Supercritical fluid chromatography
- Supercritical fluid extraction
- Radiofrequency plasma detection
- Time-of-flight mass spectrometry
- Column technology for capillary chromatography and electrophoresis

Center Highlights

- Dionex Corporation (a center spin-off company) estimates a **\$1.5 million value to the state** of Utah through use of Center-developed technologies.
- Sensar Corporation (a center spin-off company) estimates a **\$1 million value to the state** of Utah through use of Center-developed technologies.
- The Center has **developed new technology** for deactivating small diameter spherical silica packing materials, which will expand the application range of supercritical fluid chromatography, particularly in the pharmaceutical industry.
- The Capillary electrophoresis/time-of-flight mass spectrometer system is under construction and should be ready for testing in one or two months. Additional funding for this project has come from the Environmental Protection Agency.
- Center Director Milton L. Lee has received the **R&D 100 Award**, given annually for the 100 **technologically most significant products** developed nationally.

STATUS OF FUNDING

for 1995-96 fiscal year

As this report is being published in December 1995 prior to the Legislative Session, the following additional information is being provided concerning the placement of fiscal year 1995-96 funds:

SUMMARY OF 1995-96 GRANTS

Number of Centers Funded, 1995-96 Fiscal Year	20
Amount of Grants to these Funded Centers	2,312,000
Funding for the 1995-96 Commercialization Consulting Program . \$97,500	
Funding set aside for Planning Grants in 1995-96	90,000
Planning Grants approved as of 12/31/95	7

LIST OF FUNDED CENTERS

FY 1995-96

The following Centers have been approved for funding in 1995-96:

I. Established Centers	Award
Advanced Composites (BYU) - Brent Strong	\$125,000
Computer Graphics & Scientific Visualization (U/U) - Elaine Cohen	\$100,000
Dairy Foods Technology (USU) - Paul Savello	\$ 52,000
Developmental and Molecular Biology (USU) - Kenneth White	\$150,000
Meat Processing (USU) - Von Mendenhall	\$260,000
Multimedia Ed & Technology (U/U)- Magdy Iskander	\$125,000
Rapid Product Realization (BYU) - Dave Sorenson	\$200,000
Self-Organizing Intelligent Systems (USU) -Bob Gunderson	\$150,000
3-D Computer Graphics (Dixie) - Eric Pedersen	\$ 50,000
Value Added Seed Technology (USU) - Grant Vest	\$100,000
 II. New Centers:	
Design Systems (U/U) - Don R. Brown	\$100,000
Neural Interfaces (U/U) - Richard A. Normann	\$ 80,000
Electronic Systems and Technology (U/U) - Jennifer Hwu	\$150,000
Applied Molecular Genetics (BYU) - Bob Park	\$ 80,000
Flat Panel Displays (U/U) - Larry Sadwick	\$ 65,000
Magnetism in Information Technology (USU) - C.Y. Pan	\$100,000
Minerals Technology (U/U) - R. Peter King	\$125,000
Industrial Imaging (U/U) - Richard Ehrlich	\$100,000
Ventricular Assist (U/U) - Don Olsen	\$100,000
 III. Distinguished Centers:	
ACERC (BYU) - Doug Smoot	\$100,000
 IV. Planning Grants:	
Bioelectromagnetic Design (U/U) Om P. Gandhi	\$ 10,000
Control of Virus Infections (U/U) Robert Fujinami	\$ 10,000
Fossil Resin Industry (U/U) Jan Miller	\$ 10,000
Novel Applications of Fibers (U/U) Joseph Andrade	\$ 10,000
Scientific Computing and Imaging (U/U) Christopher Johnson	\$ 10,000
Utah Genome Technologies (U/U) Ray Gesteland	\$ 10,000
Solid Oxide Fuel Cells (U/U) Anil Virkar	\$ 10,000
 V. Commercialization Consulting Program	
BYU Technology Transfer Office	\$ 19,500
Utah State University Technology Transfer Office	\$ 29,250
University of Utah Technology Transfer Office	\$ 43,875
Dixie College Technology Transfer	\$ 4,875

UTAH TECHNOLOGY NEWS

Utah Technology News is a monthly publication of the Centers of Excellence Program. It provides news of the achievements, developments, and upcoming events of the program and individual centers.

Copies of the *Utah Technology News* are disseminated each month to the directors and other key personnel of the Centers of Excellence Program as well as business and technology reporters with the Utah media. The information contained in the newsletter has led on several occasions to media coverage of the marketable technologies and economic impact of centers' research.

Utah Technology News ultimately aims to foster a greater understanding of the significant role of the Centers of Excellence Program in the technological and economic development of the state.



UTAH TECHNOLOGY NEWS

Department of Community and Economic Development - March 1995

Centers of Excellence Produce Jobs, Results

The Utah Centers of Excellence Program has wrapped up another successful year in 1994. The program in the Department of Community and Economic Development enters its tenth year with significant accomplishments under its belt and more on the way.

Last year, twenty new and existing centers received \$1.9 million in state grants allowing them to transfer the technologies created through college and university-based research in Utah to the commercial sector. For that relatively small investment, the centers attracted nearly \$28.5 million in matching support to help carry out their mission.

Referred by some as a "national model" and "innovative", the Centers of Excellence Program has led to the creation of 51 centers since its inception in 1986. Those centers have resulted in 965 new jobs and another 921 positions in the 84 self-sustaining private-sector companies that have spun off from the centers. The taxes being paid by those businesses are many times what the state initially invested through the Centers program.

Just what are some of the technologies that have emerged through the Centers program? They include the identification of genetic links to cancer, the development of non-refrigerated milk with a longer shelf life, and the use of robotic technology in medical treatments, to name a few.

"The Utah Centers of Excellence Program is widely recognized as one of the most productive programs in the country," said director Rod Linton. "We have calls on a regular basis from other states requesting information on the program."

Research at Center Leads to Detection of Cancer-Causing Genes

In February, the announcement was made that research that had its beginnings at the four-year-old Center for Cancer Genetic Epidemiology at the University of Utah has produced significant findings.

Dr. Mark Skolnick, director of the center, went before the national media at an American Medical Association press conference in Washington, D.C. to announce that he and other researchers have pinpointed mutations in genes that are likely responsible for breast and ovarian cancer in women.

Dr. Skolnick says the research is particularly important because the presence of the genes would enable doctors to know that there could be a higher probability of breast cancer in certain women and therefore treat it in the earlier stages.

The researchers are now developing a test that would diagnose if a woman has any of the possibly cancer-causing mutations. Dr. Skolnick expects the test to be available in 1996 or 1997.

Much of the work by the center for Cancer Genetic Epidemiology was done in conjunction with Myriad Genetics, Inc., a Salt Lake City-based company that spun off from the center and now has 55 employees.

Thanks to media coverage of the discovery, it has been publicized in the United States and beyond. "We've had huge coverage in newspapers, magazines, television, and in the Journal of the American Medical Association," said Dr. Skolnick.

COE Advisory Council Begin Review of Centers

The Centers of Excellence Advisory will soon take to the road to begin its annual review of proposed and existing centers seeking funding for fiscal year 1996.

The directors of more than thirty planned and currently-operating centers submitted funding requests totaling \$3.9 million during the pre-proposal period ending in February, nearly twice the available money.

Members of the Advisory Council will spend part of March and April visiting each facility to get a first-hand look at the technologies being developed and the prospects for commercialization.

Council members will then make recommendations for consideration and final approval by the Division of Business and Economic Development Board.

Fuller Joins Advisory Council

The Centers of Excellence Advisory Council has a new addition.

Dr. Forrest Fuller, director of molecular biology at NPS Pharmaceuticals in Salt Lake City, has been appointed to the 14-member panel which reviews funding and other aspects of current and proposed centers.

Dr. Fuller says his experience with small companies that have grown from just a handful of employees to several dozen will benefit the council as it looks at centers that hope to sprout similar self-sustaining businesses. "I enjoy seeing the development of ideas to the production phase," he said.

.....Upcoming

March 31- Deadline for Centers proposals and funding requests

April 4- Centers proposals go to Advisory Council for review

In Space or On the Ground, USU Center Can Help Get Around

The human touch can be somewhat limited at Utah State University's Center for Self-Organizing Intelligent Systems (CSOIS)....and that's the way the center likes it.

The nearly two-year-old center headed by Dr. Robert Gunderson is working on projects that are intended to help carry out the work that man cannot or will not do.

One project is a "Mars rover", an unmanned vehicle that would explore the rocky, crater-filled surface of the far-away planet. In February, several junior high-school students gathered at USU's Science and Engineering Building to "test drive" the rover with the help of a computer link-up and software designed by CSOIS.

A rover was placed on a small-scale Mars at a science center in Toronto, Canada. A tiny camera mounted to the rover sent an image via phone lines to a computer at USU. The students there then used that image to guide the vehicle by computer across Mars, trying to avoid rocks and other obstacles.

Dr. Gunderson says the rover project has attracted the interest of NASA, the Departments of Energy and Defense, and Russia.

Another promising development at CSOIS is a "virtual-reality" wheelchair. It, too, is equipped with video cameras that relay its location back to a computer where an operator can guide the chair. Gunderson says it will be especially helpful to wheelchair-bound Alzheimer's patients.

Relationship with Center Pays Big Dividends for Utah Company

A company with ties to one of Utah's Centers of Excellence has signed an agreement with a major machine-tool manufacturer to provide software for the computer-aided design and manufacture (CAM) of machine tools.

Under the agreement, Engineering Geometry Systems of Salt Lake City will sell its software to Bridgeport Machines, Inc. which will enable the Connecticut-based firm to design and build parts for machine tools to meet the specific needs of small to medium-sized machine shops. They will jointly market and distribute the software. "It gives us access to the worldwide marketplace" through Bridgeport Machine's global sales and distribution network, said Glen McMinn, EGS president.

The agreement calls for Bridgeport Machine to acquire a 19.5% share of EGS, provide loans, and license EGS software in a deal totaling \$1 million. He says the pact will eventually result in EGS tripling its current workforce of six employees with prospects for similar arrangements with other companies and more growth in the future.

EGS recently completed a major CAM project for Hill Air Force Base involving the manufacturing of parts for landing gear. Another project is underway with the Navy.

The company opened in 1986 and established a technology-transfer partnership with the Center for Computer Graphics and Scientific Visualization at the University of Utah. The center develops computer-aided solutions for design and manufacturing problems faced by industry.

Bridgeport Machines does business in the United States and 60 other countries. Its initial contact with EGS and the center came through research inquiries at the university.

Helping Business Goal of New Center

1995 is expected to bring the start-up of at least one new Center of Excellence and the further growth of an existing one.

The proposed Center for Electronic Systems and Technology (CEST) at the University of Utah would establish a facility that would "work ...closely with local large companies and small businesses...to assist them in using technology to improve their competitiveness", according to its grant proposal.

University electrical engineering professor, Dr. R.J. Hwu, says the technology developed by the center can be applied to specific needs identified by businesses in such industries as health care, aerospace, transportation, and home electronics.

CEST hopes to work with institutions like Hill Air Force Base, Thiokol, Unisys, and National Semiconductor.

In mid 1994, the Center for Rapid Product Realization was launched at Brigham Young University. What center director David Sorensen did not entirely realize was how rapidly the center would take off.

The center helps new and growing companies in Utah convert concepts into products by providing design, prototyping, and manufacturing assistance.

During the center's first six months, 132 companies had requested services with 75 submitting formal applications. "It's been incredible," said Sorensen. "We're astonished at the response."

UTAH TECHNOLOGY NEWS

Department of Community and

Economic Development Centers of Excellence

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New Assistant Director Joins COE Program

Rajiv Kulkarni has joined the Utah Centers of Excellence Program as assistant director where he will help oversee efforts to enhance economic growth and job creation through the commercialization of technologies developed at the state's colleges and universities.

Dr. Kulkarni comes to the program with a lengthy resume in business and scientific research. "We believe his strong academic background in food technology, agriculture, and microbiology along with his business and industrial experience will be a significant asset to the Centers program," said Centers director Rod Linton.

As assistant director, Dr. Kulkarni will work with Mr. Linton is administering state funds to researchers at colleges and universities to assist them in converting late-stage research into commercially-viable products or services. "It's exciting to have programs help bring cutting-edge technology to the point of commercialization. The (COE) program has a good track record in the number of jobs and companies created," said Dr. Kulkarni.

Dr. Kulkarni has held positions in management, marketing, and research and development with such companies as Cytozyme Laboratories, Inc., an agricultural and biotechnology firm in Salt Lake City; Native Plants, Inc., also of Salt Lake City; and Campbell Soup Co. in Ohio. He has authored or co-authored 17 scientific papers.

The new assistant director earned bachelor and master of science degrees at Eastern Michigan University, an MBA from the University of Phoenix, and a doctorate in philosophy from the University of Nebraska.

New, Existing Centers Seek Funding for FY '96

The Centers of Excellence Program is in the midst of one of the busiest times of the year as staff and advisory council members review recently-submitted proposals and requests for funding from new and existing centers for fiscal year 1996.

As of the March 31 deadline, the COE program had received proposals from the directors of 32 current and proposed centers of excellence at the state's four-year colleges and universities. There are currently twenty active centers.

Advisory council members and others reviewers have spent March and April visiting assigned centers to learn first-hand of the technologies that the centers directors feel are on the verge of commercialization and what the prospects are for their success in the marketplace.

To qualify for funding, each center must show a match of two dollars from other sources to each dollar received from the state. Some proposed centers may receive planning grants of \$10,000 to assist them in completing the preparatory work to attain full centers' status.

Following the "site visits", the advisory council is scheduled to meet in late April to discuss its findings and to make recommendations on what centers should be granted funds to carry out their work. Final approval of funding levels rests with the Division of Business and Economic Development Board.

CEST, Micron Hope to Establish Ties

Officials with the proposed Center for Electronic Systems Technology (CEST) at the University of Utah say they are making progress in establishing a working relationship with Micron Technology, Inc., which plans to start construction later this year on a \$1.3 billion semiconductor manufacturing plant in Utah County.

CEST director Jennifer Hwu says meetings held at the Boise, Idaho-based company in April resulted in both parties expressing a desire to work with each other in the development of new technologies and in arrangements to fund those efforts.

Dr. Hwu says CEST would assist Micron in designing new electronic systems that would aid the company in its rapidly-growing manufacturing process. In return, Micron would provide some fabrication facilities and funding to CEST.

Dr. Hwu says having the backing of Micron, financially and otherwise, could make it easier to secure matching funds from federal and private sources and could lead to similar partnerships with other sizable companies.

While in Idaho, Dr. Hwu and other university engineering faculty members began laying the groundwork for a graduate engineering program to be offered both there and in Utah County. Micron said the availability of such courses helped it choose Utah over two other states for its new plant.

Another meeting between CEST and Micron is scheduled for May to work out more details on the proposed relationship.

.....Upcoming

April 19- COE Advisory Council concludes on-site visits of proposed and existing centers

April 20-21- Advisory Council to review on-site visits, make recommendations for fiscal year 1996 funding

Brent Strong is BYU and COE "Material Man"

Brent Strong is a materialistic person

The director of the Center for Advanced Composites and Manufacturing Engineering (ACME) is fast becoming the man to turn to for advice on how to make various products more durable and less prone to wear and breakage. Dr. Strong says he receives several inquiries a week from businesses and other entities in and out of Utah wanting to know what materials and methods will strengthen their products and extend their lifespan.

The city of Provo, as detailed in a recent article in *The Salt Lake Tribune*, sought Dr. Strong's expertise in testing the strength of plastic garbage carts for use by automated garbage trucks. Dr. Strong took on the task by having a truck pick up and set down the carts hundreds of times. He also dragged them, smashed them, and put them through other forms of abuse, all in search of durability. The results of Dr. Strong's testing are circulated among and respected by those who need to know such information like, for instance, the manufacturers of plastic garbage carts.

"Much of our work is for medical devices," said Dr. Strong, although he has also handled other types of products and even developed a baseball bat made with layers of graphite fibers.

Through 1994, ACME had assisted 129 companies and seven businesses and 473 jobs were created with the help of the technologies and assistance provided by the center. Estimates from ACME and companies assisted by ACME are that the value of products receiving ACME assistance will total \$1.45 billion over the next ten years.

Advanced Composite Manufacturing and Engineering became a Center of Excellence in 1990.

Interest in COE Program Goes Well Beyond Utah's Borders

It's been fairly common for economic-development officials in other states to inquire about Utah's Centers of Excellence Program as they seek to start something similar in their own states.

Utah may soon be getting a call from Belarus.

Last fall, Larissa Titarenko traveled from her home country of Belarus to the United States as a Visiting Fulbright Scholar at Syracuse University. She spent some time at the University of Utah where she looked at ways of helping the former Soviet republic continue the often-painful transition from communism to a market economy.

Among the measures Ms. Titarenko studied and hopes to implement in Belarus are university-industry-government partnerships that are at the heart of the Centers of Excellence Program. She is hopeful that through a successful equivalent of the COE program, new technologies can be introduced and commercialized leading to new high-tech companies and skilled jobs in Belarus.

Ms. Titarenko says that areas that would particularly benefit from a Belarus COE program include agriculture, natural resources, biotechnology, information technologies, aerospace, and advanced materials and processes. Most of the Centers of Excellence in Utah fall into those same categories.

Time will tell how successful Ms. Titarenko will be in her efforts, but it might be wise to learn how to say "Centers of Excellence" in Russian.

COE Program Receives Full Funding for FY '96

The Centers of Excellence Program will again receive funding of \$2.5 million for fiscal year 1996 which begins July 1st.

Despite a reduction of \$500,000 recommended by legislative analysts, Utah legislators passed a state budget that left the COE appropriation unchanged from the current fiscal year.

Members of an appropriations subcommittee heard COE officials as well as vice presidents and engineering deans from some of Utah's four-year universities paint a dark picture for technology development and business and job growth in the state if the COE budget was trimmed.

Former state senator Ron Ockey also told lawmakers that every resource was needed just for Utah to keep up in the increasingly-competitive world of technology development and job creation. In the end, panel members voted in favor of the \$2.5 million in funding for the COE Program.

What Have You Done Lately ?

Please keep us posted on significant developments at your center.

If you have had noteworthy achievements recently in research, licensing agreements, new company spin-offs, or received notable grants or awards, please contact Darrell Kirby at the Centers of Excellence at 538-8812.



**CENTERS OF
EXCELLENCE**

UTAH TECHNOLOGY NEWS

Department of Community
and

Economic Development
Centers of Excellence

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**CENTERS OF
EXCELLENCE**

UTAH TECHNOLOGY NEWS

Department of Community and Economic Development - May 1995

Board Gives Go-Ahead For Funding of Centers of Excellence

The Utah Division of Business and Economic Development Board has approved funding twenty new and existing Centers of Excellence at the state's four-year colleges and universities for fiscal year 1996.

The board's action means that \$2.5 million appropriated by the Utah legislature during the 1995 session will be awarded to approved centers to allow them to convert technologies in the late stages of research into marketable products and services. A small portion of that funding will enable the COE Commercialization Consulting Program to help centers achieve the goal of the COE Program since it was established in 1986 of creating self-sustaining and job-producing businesses.

Just a few of the technologies proposed for commercialization by the centers include the identification and transfer of DNA markets to identify superior breeding plants and animals; industrial-oriented electronic systems to help Utah companies compete more effectively in the world market; more productive, drought-resistant turf grasses, including a variety for grazing; and a relatively low-cost artificial heart for patients awaiting heart transplants.

"With the approval of nine new centers and funding of the commercialization consulting initiative, I believe the Centers of Excellence Program stands on the threshold of significant new achievements," said Rod Linton, COE Program director.

More than 50 centers have been created since the program's inception, leading to the creation of nearly 2,000 jobs, 84 spin-off companies, and assistance for dozens of others.

Audit Finds No Wrongdoing by USU Centers

An audit of the operations of two Centers of Excellence at Utah State University shows that the research facilities have followed COE Program guidelines and state laws.

Allegations last year that the Center for Developmental and Molecular Biology and the National Center for the Design of Molecular Function misappropriated COE funds, that expenses and operations were not adequately monitored, and that research at the centers was fraudulent were found to be untrue. "Our limited investigation did not find any evidence to support the allegations," wrote state Auditor General Wayne Welsh in a letter to legislative leaders.

Welsh broke down his findings into several categories:

Diversion of state funds: A "limited review" uncovered no evidence that state funds granted to the Center for Developmental and Molecular Biology and the Center for the Design of Molecular Function were misused. Furthermore, the audit states that the COE Program "has adequate internal controls to monitor and track state funds."

Project Monitoring: The COE Program "appears to have adequate procedures in place to monitor the progress of funded projects."

Scientific Merit: The investigation showed that each center underwent "sufficient scientific review" by experts to validate the centers' scientific endeavors.

CVAST to Release New Grass Variety Soon

The Center for Value-added Seed Technology at Utah State University plans to release a new variety of grass seed later this year.

Dr. Kay Asay of CVAST says the hybrid grass would be used for livestock grazing on public and private rangeland. "It's a forage grass that is taller and more productive," he said.

A USU agricultural research review committee has given its approval for the release of the seed. Other regulatory hurdles must still be cleared before the seed can be put on the market. Dr. Asay says seeds will be planted on a test basis this summer, and the grass should yield seeds for additional plantings about a month later.

Since becoming a Center of Excellence in 1991, CVAST has been working on the production of new grasses and plants that are more drought resistant, productive, and that fit particular needs.

CSOIS Rover Attracting International Attention

In February, the Center for Self-Organizing Intelligent Systems at Utah State University demonstrated its Mars rover, a miniature-scale vehicle designed by CSOIS to explore Mars-like landscapes and other places where no man has gone before.

The vehicle was operated by telepresence control communications software designed by CSOIS using computers and regular telephone lines.

CSOIS was recently contacted by officials in Denmark who are interested in setting up a similar program there for educational purposes. It could be in place this summer.

.....Upcoming

*May 20- Deadline for Centers to
submit semi-annual reports
to COEP*

Center, Company Hope Snow Bracket Sales Go Through The Roof

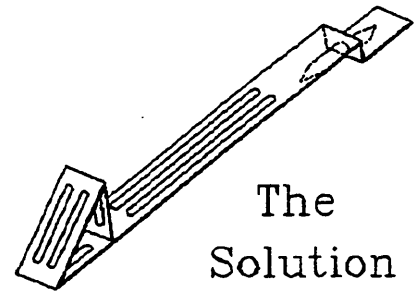
It looks simple and inexpensive enough-- a sort of spike not much longer than your hand, in some cases. But the man who came up with the idea and the Center of Excellence that helped refine it into a workable product hope it will solve a potentially-hazardous problem in the Intermountain region and eventually generate some big profits.

The device is called a snow bracket. Developer Terry Anderson says its purpose is to keep chunks of accumulated snow on rooftops from sliding off and injuring someone below or damaging the roof and anything else in its path. Anderson says his experience as a roofing consultant and his observation of snow retention devices on rooftops in the Alps and other parts of Europe gave him the idea that something similar might catch on locally. "It's a relatively new market in the Rocky Mountain area," he said, adding that most of the initial interest in the bracket is coming from Utah and Colorado.

The Center for Rapid Product Realization at Brigham Young University helped Anderson shape the bracket into its present form in metal, copper, and stainless steel varieties to be installed between various types of roofing tiles. Tests were conducted to determine its effectiveness. With the help of one of the Centers of Excellence Program's commercialization consultants, Anderson then formed Tile Roof Associates, an American Fork company with a staff of three, to market and sell the gadgets. They are manufactured by an Ogden firm, but Anderson says other manufacturers are expressing interest in making the device.

Several thousand snow brackets have already been made and are selling for \$2.60 to \$6.00 each. Anywhere from 250 to 500 brackets would be installed on the average-sized home. Anderson says negotiations are underway with David Sorensen, director of the Center for Rapid Product Realization, for the payment of royalties to the center and he hopes to expand the business into the Northwest and Canada.

Snow Brackets



The
Solution

Courtesy- Terry Anderson

U of U Center to Participate in NSF Event

The Center for Multimedia Education and Technology at the University of Utah has been invited to participate in a prestigious National Science Foundation event in June.

CMET will be part of a selected group of NSF grant recipients to attend the NSF Showcase June 25-28 in Anaheim, California. CMET director Magdy Iskander says it will feature some of the best technologies and products funded by NSF grants and will be attended by members of the American Society of Engineering Education.

CMET develops, produces, and distributes interactive multimedia software packages for science, math, and engineering education, including physics and calculus.

In mid May, Dr. Iskander manned a CMET booth at an Institute of Electrical and Electronics Engineers exhibition in Orlando, Florida. Up to 7,000 people attended the gathering where Dr. Iskander basked in the exposure for the center and sold its software products.

Center Spin-off Company Enters Agreement with Pharmaceutical Firm

A Salt Lake City company with ties to a Center of Excellence has entered into a major agreement with a pharmaceutical company that both firms hope will lead to the production of drugs to treat certain cardiovascular diseases.

Under the agreement, Myriad Genetics, Inc. could receive up to \$60 million in phases over five years from New Jersey-based Ciba Pharmaceuticals to study genetic and molecular links to heart disease and high-blood pressure. Ciba, in turn, would develop drugs to treat the disorders. About half of the funding also buys Ciba a small ownership interest in Myriad.

Myriad Genetics spun off from the Center for Cancer Genetic Epidemiology at the University of Utah. "This is what you hope for. It's big," said center director Dr. Mark Skolnick, referring to the new partnership between Myriad and Ciba. He says it will bring greater visibility and prestige to both the center and Myriad.

The Center for Cancer Genetic Epidemiology and Myriad Genetics have attracted significant attention and press coverage recently for their work in identifying mutations in genes that could be responsible for breast and ovarian cancer in women.

Myriad has 67 employees with more expected in the future because of the new pact with Ciba Pharmaceuticals.

UTAH TECHNOLOGY NEWS

*Department of Community
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*Economic Development
Centers of Excellence*

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Centers Gearing Up For Start of New Year

There will be an almost even balance of old and new come July 1st when the Centers of Excellence Program begins fiscal year 1996. Eleven existing centers will officially start another year of research and development and efforts to commercialize their technologies. Nine centers will begin their existence in high hopes of achieving the same goals. The new centers, their locations, directors, and brief descriptions, are as follows:

Applied Molecular Genetics	BYU	Robert Park
Identification and transfer of DNA markers to identify superior breeding plants and animals.		
Comminution Technology	U of U	Peter King
Development and marketing of items related to production and grinding of materials for minerals industry.		
Design Systems	U of U	Don Brown
Research and development of software for companies to use in their product and process-design functions.		
Electronic Systems	U of U	R. J. Hwu
Work with industry to design and produce specific industrial-oriented electronic systems to enhance production and competitiveness.		
Industrial Imaging	U of U	Robert Ehrlich
Reservoir core analysis involving linking of geological description with the physics of flow or resource such as petroleum.		
MTV Flat Panel	U of U	Laurence Sadwick
Patent-pending method of making low-cost, high-yield microminiature thermionic vacuum emitters to perform function of conventional cathode-ray tubes and matrix liquid-crystal displays.		
Magnetism in Information Technology	USU	C.Y. Pan
Research, testing, and improvement of highly-magnetic materials for items, such as motors, sensors, magnetic storage media, etc.		
Neural Interfaces	U of U	Richard Normann
Research of technologies, the core of which is a silicon-based array of microelectrodes, to be implanted in the cerebral cortex of patients to record neural activity of those who are blind, deaf, or quadriplegic.		
Continuous Flow Ventricular Assist Device	U of U	Donald Olsen
Development of heart-assist device for patients awaiting heart transplants.		

Two Centers Graduate, Now On Their Own

The Center for Cancer Genetic Epidemiology at the University of Utah and the Center for Chemical Technology at Weber State University, which began in 1991 and 1990 respectively, have completed their eligibility for regular Centers of Excellence Program funding and are now sustaining themselves as they continue their research and commercialization efforts.

The Center for Cancer Genetic Epidemiology has been involved in pioneering research in the identification of genetic mutations that could cause breast, ovarian, and other forms of cancer. That work has led to the creation of Myriad Genetics, Inc., which employs 60 people in furthering the study and commercialization of the gene technology.

The Center for Chemical Technology, headed by Dr. Edward Walker, defines itself as an "innovative resource to the community by conducting applied research in a variety of chemically-related areas leading directly to new or enhanced products."

The center's research has included the harvesting of algae from the Great Salt Lake to provide an almost endless supply of the nutrient beta carotene and a patented oil-sand separation technology that could recover millions of gallons of petroleum from sand, such as that spilled in Kuwait during the Gulf War. New production facilities and jobs are planned by Chemical Technology's corporate sponsors to take advantage of these technologies.

Center Goes Back To Its Roots

The Center for Genetic Improvement of Livestock (CGIL) at Utah State University will end its existence as a separately-funded center as of July 1st and again become part of the center from which it sprouted.

The decision was made recently by the COE Advisory Council and approved by the state Division of Business and Economic Development Board to combine CGIL with the Center for Meat Processing Technology at USU. Members of both bodies say that the research of both centers parallels each other enough that their work and commercialization efforts can be put under one banner.

CGIL was split from Meat Processing in 1992 to devote its efforts to genetically improving livestock through the use of genetic markers and embryo cloning. CGIL breeds sheep with more muscle and less fat in hopes the animals will produce meat with the same qualities.

The center says many Utah sheep producers are struggling because consumers have been slow to acquire a taste for lamb meat because of its high fat content and toughness.

Von Mendenhall was director of both Meat Processing and CGIL before giving way to Noelle Cockett at CGIL in 1994.

.....Upcoming

- July 1- Fiscal year 1996 begins
- July 11- Center directors' orientation meeting, at DCED, 10:00 am
- July 20- Deadline for (FY 1995) year-end invoices to be submitted to COEP office

Two ACERC Researchers Receive DOE Grants

Two researchers at the Center for Advanced Combustion Engineering Research at Brigham Young University have been awarded grants of nearly \$200,000 each from the Department of Energy.

Dr. Dale Tree applied for and received \$199,926 from the DOE's University Coal Research Program for his research on "Temperature, Velocity, and Species Profile Measurements for Reburning and Advanced Reburning." Dr. Thomas Fletcher will get \$198,264 for his work on "Determination of the Forms of Nitrogen Released in Coal Tar during Rapid Devolatilization." "Even with the intense competition, two of our investigators out of the hundred applying won these grants," said Michael King, manager of ACERC.

DOE's University Coal Research Program awards funding to research teams lead by a university or college professor "that conduct fundamental studies of coal and coal-related topics," according to the department. The funding given to Professors Tree and Fletcher was part of \$5.3 million dollars in federal money handed out to 25 new teacher-student research teams in 18 states.

ACERC was one of the first Centers of Excellence to be established when the program was created in 1986. It has focused on the development of advanced combustion technologies that take advantage of alternative low-cost fuel resources such as coal, heavy, oil, oil shale, and tar sands. ACERC acquired "distinguished" center status in 1991.

Planning Grant Proposals Being Reviewed

Officials with the Centers of Excellence Program are getting a glimpse at some possible future Centers of Excellence with the arrival of proposals for COE Program planning grants.

Researchers are submitting proposals for technologies they feel can be commercialized and are seeking planning grants to allow them to take the necessary steps to determine the feasibility of creating new centers at Utah's colleges and universities. After an initial review and approval by COE staff, the proposals will eventually make their way to the Division of Business and Economic Development Board for final consideration and approval.

Earlier this year, a planning grant was okayed for a proposed Center for Electronic Systems Technology at the University of Utah. The facility later acquired full centers' status and funding and will officially begin operations July 1st.

Orientation Set for Centers' Directors

The Centers of Excellence Program has scheduled an orientation meeting for the directors of all new and existing centers that are funded for fiscal year 1996.

The gathering slated for July 11, 10 a.m. to 2 p.m., at the Department of Community and Economic Development, Conference Room 501, will feature brief presentations on all aspects of the program that directors will need to know during their tenure with the COE Program. They include the program's objectives, centers' performance requirements, matching funds, contracts, invoices, commercialization, and semi-annual and annual reports, to name a few.

COE Program director Rod Linton says it's hoped that the orientation meeting will answer most questions directors have about their participation in the program while also ensuring its smooth and efficient operation.

New Center Director Gets Federal Grant

The director of the new Center for Communion Technology at the University of Utah has received a grant of just under \$200,000 from the Department of Energy (see related story this page).

Peter King plans to use the DOE grant for research into the separation of sulfur from other mineral matter in coal.

Dr. King says that by separating the sulfur before coal is burned in a furnace, it prevents the emission of highly-polluting sulfur dioxide into the atmosphere. "You reduce the possibility of acid rain."

Don Olsen Heads Second Heart Center

In 1991, the Center for Total Artificial Hearts and Biomedical Devices at the University of Utah became a distinguished center for its work in the development of implantable artificial hearts and the testing and evaluation of other medical devices.

Dr. Don Olsen, who was director of Total Artificial Hearts, is back as head of the new Center for Continuous Flow Ventricular Assist Device. His focus this time will be on a heart-assist device with all-electric magnetic bearings that will help pump blood "over a wide range of the needed cardiac output."

The device will be implanted and tested in calves. Dr. Olsen estimates the final product could draw sales of \$25 million to \$1 billion annually and create hundreds of jobs.



**CENTERS OF
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MEDIA SUMMARY

Two complete news articles are enclosed along with a list of other articles that have appeared during the 1994-95 fiscal year. If you would like complete copies of any of these articles, please contact Darrell Kirby at 538-8812.

Y. CENTER CAN HELP COMPANIES THAT HAVE IDEAS FOR PRODUCTS

Utah companies with great ideas for new or improved products can receive professional help in developing their ideas through a newly established Center for Excellence at Brigham Young University.

The Rapid Product Realization Center operated by BYU's department of manufacturing engineering and engineering technology can help fledgling product ideas take flight, according to director David Sorensen.

"Getting to market very quickly is an extremely crucial issue in industry," said Sorensen. "A manufacturer needs to capture a market share as quickly as possible before a competitor has a chance to get established."

The BYU department, which last year was named the top accredited manufacturing department in the nation, has at its disposal more than \$10 million in state-of-the-art facilities and equipment as well as 25 faculty professionals and more than 300 students eager to receive hands-on experience in product development, said Sorensen.

"With our equipment and personnel, we can do in a few hours what would normally take weeks or even months in a normal product development environment," he said. The center can take a product from its initial concept definition through design prototype and even through marketing using the department's extensive resources, including a computer-assisted design lab, foundry, industrial laminators, high-pressure water jet, mechanical presses, lathes, injection molders, vacuform molders, rapid pro-to-typing equipment, electronics lab and

even impact testers and a weatherometer to simulate actual aging.

In granting \$200,000 in funding for this first year, the Utah Department of Community and Economic Development has mandated that the center help at least 10 new Utah-based products to maturity. "Many companies spend several times that amount for development of a single product," Sorensen said.

With the state funding, the center will underwrite the majority of costs associated with each product in exchange for a small royalty on product sales. "The royalty will allow the center to continue with future support for Utah's manufacturing industries," Sorensen said.

Information on the center is being mailed this week to 1,500 Utah companies that might have potential products. "We're trying to focus on consumer products with 10 or fewer parts that would sell for \$200 or less," noted Sorensen. For more information or to receive an application form, contact David Sorensen at the RPR Center, 378-9000 or fax 378-7575.

The state of Utah sets aside about \$2.5 million each year to fund 25 Centers for Excellence, which assist Utah companies in moving more products into industry.

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BREAST-CANCER GENE MUTATIONS FOUND

Utahns lead the way. Geneticists expect to devise test to find risk factors.

By Joseph Bauman, science writer

Science took a giant step Tuesday toward protecting women from death by breast and ovarian cancer with publication of research pinpointing mutations in a gene that can cause the diseases.

The American Medical Association held a press briefing Tuesday at the National Press Club in Washington, D.C., to announce the discoveries, which are published in its journal. Utahns led the way both in pinpointing the gene and in finding the particular mutations of the gene. Mark H. Skolnik, vice president of Myriad Genetics in Salt Lake City, was scheduled to brief reporters about the breast cancer findings during the Washington press conference. In the not-too-distant future, geneticists expect to devise a blood test that would show whether a woman has any of the dozens of mutations.

For women in families struck by inherited breast cancer, detecting the defective gene would alert doctors to be aggressive in searching for the first signs of cancer, when it is easiest to treat. Women in such families who are screened and found not to have the defect would know their risks are no greater than normal.

The defective coding in this particular gene is believed to be responsible for up to 80 percent of families that have both early breast cancer and ovarian cancer. For inherited breast cancer alone, it could be responsible for half of all cases.

According to the article, the strongest known risk factor for breast cancer is a family history of the disease. Still, inherited breast cancer apparently makes up only about 5 percent of breast cancer cases.

The research, printed in the Journal of the American Medical Association, focused on a gene called BRCA1 - for the breast cancer gene No. 1 - that was identified last year. The identification was by Myriad Genetics plus scientists at the University of Utah and elsewhere.

In the latest findings, nine laboratories in the United States, Canada and Britain collaborated to find which mutations are at fault in the BRCA1 gene. Lead author in the paper was Donna Shattuck-Eidens of Myriad Genetics, a private company based at the U.'s Research Park. Utahns working on the latest project include Myriad's Skolnik, who is also from the University of Utah School of Medicine, and David E. Goldgar of the U. The labs screened 872 BRCA1 samples from patients with breast or ovarian cancer, mostly from high-risk families, and an additional 714 samples from other patients.

"BRCA1 mutations have now been identified in a total of 80 patient samples. Thirty-eight distinct mutations were found," the article says. Skolnik said that information is now outdated, because labs are still screening for mutations on the same large gene. "Last week we knew of 50; this week we know of 57," he said in a briefing for local reporters held on Feb. 2. The information was embargoed until Tuesday. At the same briefing, Goldgar said another genetic defect suspected of causing breast cancer - named BRCA2 - has been generally

localized but hasn't been isolated yet. Shattuck-Eidens said other genes not yet localized may be responsible for some of the inherited cancers. "The majority of the mutations that have been identified (in BRCA1) are of the very disruptive type," she said. That is, they aren't harmless genetic changes; they're the type that could cause a critical protein to be truncated, causing cancer. "The termination of a protein seems to be a very important and disruptive mutation," she said. Skolnik said the latest findings were "what I expected. Genes usually have a lot of mutations." The disappointment is that the gene itself turned out to be about four times as large as expected, which allows more chances for mutations.

Goldgar said the research was concentrated on extremely high-risk families. The next step is to take other groups and check for the frequency of the same mutations.

According to Skolnik, three families in Italy had certain mutations of BRCA1 that were found nowhere else. Some mutations found in black American families did not turn up on Caucasians. When will a blood test be available to screen for BRCA1 defects? "It really still is hard to know how many mutations we'll be looking at," Skolnik said. That means a blood test is still some time off, because scientists aren't sure of all the mutations on BRCA1 that they will have to be alert for.

Goldgar said his group at the U. and Myriad, plus others in the United States and Canada, are working at isolating BRCA2. "The way it looks now is the risks for breast cancer for BRCA2 are pretty similar to that for BRCA1," he said. BRCA2 might have less culpability for ovarian cancer, but it also poses some risk for breast cancer in men, which is not implicated in BRCA1. His feeling is that BRCA2 might turn out to be

slightly less significant for breast cancer than BRCA1.

If a BRCA mutation appeared in a blood test performed on a young woman who did not have breast cancer, it would alert doctors to be "awfully concerned," Goldgar said. According to the AMA, by the age of 85 breast cancer strikes one American woman in nine. The group's report says, "The high frequency of protein-terminating mutations and the observation of many recurrent mutations found in a diverse set of samples could lead to a relatively simple diagnostic test for BRCA1 mutations."

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Centers of Excellence Press Articles

July 1, 1994 - June 30, 1995

"Professors get \$80,000 state grant" - The (Provo) Daily Herald, June 27, 1995

"WSU professor hopes to strike oil"- Ogden Standard-Examiner, June 13, 1995

"Geologist among 7 who will receive awards"- Deseret News, June 10, 1995

"7 Honored for Contributions to Science" - The Salt Lake Tribune, June 7, 1995

"Board OKs funding for centers of excellence"- The (St. George) Spectrum, June 4, 1995

"Centers of Excellence growing at BYU"- The (Provo) Daily Herald, May 31, 1995

"Centers of Excellence Funding is Renewed"- The Salt Lake Tribune, May 31, 1995

"New round of funding set to help Centers of Excellence statewide"- Deseret News, May 27, 1995

"Guidelines for Centers of Excellence"- Deseret News, May 15, 1995

"Funding issued for industry research"- Ogden Standard-Examiner, May 14, 1995

"Audit clears program of charges"- Ogden Standard-Examiner, May 2, 1995

"Assistant chief is selected for excellence unit"- Deseret News, April 13, 1995

"BYU Engineer Is Lauded as Guru of Garbage-Cart Tests"- The Salt Lake Tribune, March 23, 1995

"Utah State center helps Cache Valley students maneuver through space"- The (Logan) Herald-Journal, February 22, 1995

"USU shows off research work"- The (Logan) Herald-Journal, February 21, 1995

"Kids send rover over 'Martian' terrain"- Deseret News, February 18, 1995

"Breast-cancer mutations found"- Deseret News, February 14, 1995

"Legislature urged not to cut funding for program,

division"- Deseret News, February 6, 1995

"Center Is Fighting for Funds"- The Salt Lake Tribune, February 4, 1995

"Provo man develops portable rebounder"- Deseret News, January 18, 1995

"Grant approved to study need for new center"- Deseret News, January 17, 1995

"Firm's X-ray windows blast off for Mars in '96"- Deseret News, January 8, 1995

"State outlines development policy"- Deseret News, December 2, 1994

"Changes urged for Centers of Excellence"- Deseret News, November 30, 1994

"Services director to head state office"- Deseret News, October 27, 1994

"Board finally gets a quorum, oks grants to BYU, U."- Deseret News, October 19, 1994

"State programs create interesting technologies"- Deseret News, September 19, 1994

"Scientists isolate gene linked to cancer"- Deseret News, September 14, 1994

"2 USU research centers undergoing audit at request of taxpayer group"
- Deseret News, September 6, 1994

"Program under microscope"- Ogden Standard-Examiner, September 4, 1994

"Y. center can help companies that have ideas for products"- Deseret News, July 27, 1994

APPENDIX

LEGISLATION FORMING THE CENTERS OF EXCELLENCE PROGRAM

PART 6
Centers of Excellence

9-2-601. Purpose.

(1) The Legislature recognizes that the growth of new industry and expansion of existing industry requires a strong technology base, new ideas, concepts, innovations, and prototypes. These generally come from strong research colleges and universities. Technical research in Utah's colleges and universities should be enhanced and expanded, particularly in those areas targeted by the state for economic development. Most states are enhancing their research base by direct funding, usually on a matching basis. The purpose of this part is to catalyze and enhance the growth of these technologies by encouraging interdisciplinary research activities in targeted areas. The Legislature recognizes that one source of funding is in matching state funds with federal funds and industrial support to provide the needed new technologies.

(2) The Legislature recommends that the governor consider the allocation of economic development funds for Centers of Excellence to be matched by industry and federal grants on at least a two-for-one basis.

(3) The Legislature recommends that such funds be allocated on a competitive basis to the various colleges and universities in the state. The funds made available should be used to support interdisciplinary research in specialized Centers of Excellence in technologies that are considered to have potential for economic development in this state.

History: C. 1953, 63-62-1, enacted by L. 1985, ch. 103, 1; 1986, ch. 109, 1; renumbered by L. 1992, ch. 241, 60.

Amendment Notes. - The 1992 amendment, effective March 13, 1992, renumbered this section, which formerly appeared as 63-62-1, and substituted "part" for "chapter" in Subsection (1).

9-2-602. Short title - Definitions.

(1) This part is known as the Centers of Excellence Act."

(2) As used in this part, "Centers of Excellence" means university-based, industry-supported, cooperative research and development programs.

History: C. 1953, 63-62-2, enacted by L. 1985, ch. 103, 2; 1986, ch. 109, 2; renumbered by L. 1992, ch. 241, 61.

Amendment Notes. - The 1992 amendment, effective March 13, 1992, renumbered this section, which formerly appeared as 63-62-2; inserted the subsection designations; and substituted "part" for "chapter" in two places.

